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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/816,168	04/02/2004	Tsutomu Nakada	NAKATA3	7874
1444 7590 01/28/2008 BROWDY AND NEIMARK, P.L.L.C. 624 NINTH STREET, NW SUITE 300 WASHINGTON, DC 20001-5303			EXAMINER WONG, EDNA	
			ART UNIT 1795	PAPER NUMBER
			MAIL DATE 01/28/2008	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary**

Application No.

10/816,168

Applicant(s)

NAKADA ET AL.

Examiner

Edna Wong

Art Unit

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 10 January 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) 1-11 and 19-24 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 12-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>October 13, 2004</u> . | 6) <input type="checkbox"/> Other: _____  |

### ***Election/Restrictions***

Applicant's election with traverse of Group II, claims **12-18**, in the reply filed on January 10, 2008 is acknowledged. The traversal is on the ground(s) that as regards Groups III and IV, applicants respectfully request that the requirement be withdrawn and that method claims 19-24 be examined along with the elected method claims 12-18. Even if the methods are patentably distinct from one another, applicants respectfully submit that the examiner should be guided by the second paragraph of MPEP 803 which requires examination of the non-elected subject matter if it would not constitute a "serious burden" to do so. Applicants submit that the methods are sufficiently similar to one another that they should all be examined in the same application. This is not found persuasive because the inventions have acquired a separate status in the art due to their recognized divergent subject matter. The divergent subject matter of method claims 19-24 requires a different field of search which would result in different multiple art rejections.

The requirement is still deemed proper and is therefore made FINAL.

Accordingly, claims **1-11 and 19-24** are withdrawn from consideration as being directed to a non-elected invention.

### ***Specification***

The disclosure is objected to because of the following informalities:

page 24, line 15, the words -- (not shown) -- should be inserted after the

number "7".

page 24, line 16, reference character "2" has been used to designate both a substrate and a wafer (from page 9, line 3). It is unclear what reference character "2" designates. See also page 24, line 20; and page 25, line 6.

Appropriate correction is required.

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims **12-18** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Mikkola et al.** (US Patent Application Publication No. 2004/0217009 A1) in combination with **Tench et al.** (US Patent No. 6,989,084 B2).

Tench teaches a plating method for forming a plating film (= depositing a layer of copper) [page. 4, [0040]] on a conductor layer (= an underlying conductive seed layer) [page 4, [0042]], which is formed on at least a part of a structural object (= an integrated circuit) [page 5, [0046]] having a concave-convex pattern (= small apertures, e.g., 0.18  $\mu\text{m}$  or smaller) [page 4, [0042]] on a semiconductor substrate (= a semiconductor wafer) [page 5, [0050]], comprising

providing a cathode potential to the conductor layer (= the seed layer = the cathode) [page 6, [0054]]; and

supplying a plating solution (= a copper plating bath) [page 4, [0040]] which electrically connects an anode with the conductor layer (= the seed layer = the cathode) [page 6, [0054]],

wherein the plating solution contains 25-75 g/l of copper ion (= 15 to 65 g/L of copper ions) [page 2, [0018]] and 0.4 mol/l or more of an organic acid or inorganic acid (= 0-100g/L of acid electrolyte) [page 2, [0019] and [0022]] and a porous membrane is installed between the conductor layer and the anode (= the anode and cathode are in intimate contact, being separated by a porous membrane) [page 6, [0054]].

The organic acid or inorganic acid is sulfuric acid, alkane sulfonic acid, or alkanol sulfonic acid (page 2, [0019]).

A copper compound selected from the group consisting of copper sulfate, copper oxide, copper chloride, copper carbonate, copper pyrophosphate, copper alkane sulfonate, copper alkanol sulfonate, and organic acid copper is used as a

copper ion source (page 2, [0018]).

The organic acid or inorganic acid is sulfuric acid (page 2, [0019]) and the copper ion source is copper sulfate (page 2, [0018]).

The organic acid or inorganic acid is sulfuric acid (page 2, [0019]), the copper ion source is copper sulfate (page 2, [0018]), and the copper ion concentration is 58 g/l or less (= 15 to 65 g/L of copper ions) [page 2, [0018]].

The concave-convex pattern formed on a semiconductor substrate comprises a pattern with a wiring width or via of 0.1  $\mu\text{m}$  or less (= 0.1  $\mu\text{m}$  wide) [page 6, [0054]].

The method of Mikkola differs from the instant invention because Mikkola does not disclose the following:

a.       Wherein the porous membrane is an electric resistor, as recited in claim 12.

Mikkola teaches that the anode and cathode are in intimate contact, being separated by a porous membrane (page 6, [0054]).

Like Mikkola, Tench teaches a method for electroplating a semiconductor wafer. Tench teaches that a solution barrier **243** may comprise of an ion conducting membrane or a porous insulating material (e.g., plastic, glass or ceramic frit) in the form of a substantially continuous sheet or multiple discrete elements. A solution barrier of relatively high electrical resistance also provides the equivalent of a large anode to cathode separation so that uniform metal

deposition can be obtained over the surface of wafer 230 with a small volume of catholyte, which increases wafer plating throughput by decreasing the time required for filling and draining the catholyte (col. 5, lines 53-66).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the porous membrane described by Mikkola with wherein the porous membrane is an electric resistor because a solution barrier of relatively high electrical resistance would have provided the equivalent of a large anode to cathode separation so that uniform metal deposition can be obtained over the surface of wafer with a small volume of catholyte, which would have increased wafer plating throughput by decreasing the time required for filling and draining the catholyte as taught by Tench (col. 5, lines 53-66).

b. Wherein the plating method is carried out at an electrical conductivity of 3 S/m or less, as recited in claim 13.

The plating method of Mikkola is inherently carried out at an electrical conductivity. Although the electrical conductivity is not specifically disclosed by Mikkola, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the electrical conductivity described by Mikkola with wherein the plating method is carried out at an electrical conductivity of 3 S/m or less because the electrical conductivity is a result-effective variable and one skilled in the art has the skill to calculate the

electrical conductivity that would have determined the success of the desired reaction to occur (MPEP § 2141.03 and § 2144.05(II)(B)).

The electrical conductivity is a measure of a material's ability to conduct an electrical current. Thus, the electrical conductivity would have depended on the metal used as the seed layer and the metal that is deposited.

The electrical conductivity is strongly dependent on temperature. In metals, electrical conductivity decreases with increasing temperature, whereas in semiconductors, increases with increasing temperatures. Thus, the electrical conductivity would have depended on the temperature of the method.

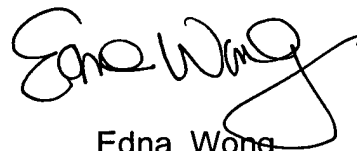
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through



Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Edna Wong  
Primary Examiner  
Art Unit 1795

EW  
January 23, 2008